REMARKS

I. Application Status

Prior to entry of this Response, claims 1-6, 9-11, 13, 14, 16, 18, and 20-28 were pending in the Subject Application. Claims 6, 14, 23, 24, 27, and 28 currently stand withdrawn. Claims 1-5, 9-11, 13, 16, 18, 20-22, 25, and 26 are currently under examination on the merits. Claims 1, 10, and 11 are independent claims.

In the pending Office Action, claims 11, 13, 16, 18, 20-22, 25, and 26 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly not meeting the written description requirement. Claim 25 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

Claims 1-5, 9-11, 13, 16, 18, 20-22, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly having been obvious over U.S. Patent No. 4,097,311 to Ishibashi et al. ("Ishibashi").

Claims 1-5, 9-11, 13, 16, 18, 20-22, 25, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly having been obvious over Japan Patent Publication No. 10-088391 to Suda ("Suda") in view of Japan Patent Publication No. 10-280103 to Ono et al. ("Ono").

Claims 1-5, 9-11, 13, 16, 18, 20-22, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly having been obvious over Szummer et al., "Hydrogen surface effects in ferritic stainless steels", *J. Alloys and Compounds*, 293-295 (1999) 356-360 ("Szummer") in view of Ono.

Claims 1-5, 9-11, 13, 18, 21, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly having been obvious over Szummer in view of International Patent Application Publication No. WO 99/10554 to Linden et al. ("Linden").

Claims 1-5, 9-11, 13, 16, 18, 21, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly having been obvious over Szummer in view of Japan Patent Publication No. 06-172933 to Uematsu et al. ("Uematsu").

Claims 1-5, 9-11, 13, 16, 18, 20-22, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly having been obvious over Szummer in view of Japan Patent Publication No. 09-209092 to Matsui et al. ("Matsui").

Applicant respectfully traverses all rejections. In view of the amendments and remarks set forth herein, Applicant respectfully requests reconsideration, withdrawal of the rejections, and allowance of the Subject Application.

II. Claim Amendments

Claims 2, 14, 18, 20-23, 25, 27, and 28 are amended herein to address issues of form. The amendments do not add new matter to the Subject Application.

Claims 1, 10, and 11 are amended herein to recite "a ferritic stainless steel comprising 0.2 to 1.0 weight percent aluminum". Claims 3, 4, 9, 13, 16, 24, and 26 are amended herein to maintain consistency with the independent claims. Support for the amendments may be found in the as-filed specification of the Subject Application in, for example, paragraph [0071]. The amendments do not add new matter to the Subject Application.

The present amendments are made without prejudice or disclaimer to the subject matter of the claims as originally filed. Furthermore, Applicant does not acquiesce in or otherwise concede the correctness of the rejections to the original claims. Accordingly, Applicant hereby reserves the right to pursue the subject matter of the original claims in related applications that may be currently on file or filed at a later date. Moreover, Applicant hereby reserves the right to submit in such related applications arguments made in connection with the Subject Application. The cancellations, amendments, and arguments presented herein are solely made to expedite the prosecution of the Subject Application.

III. New Claims

New claims 99-101 are added herein. Support for new claims 99-101 may be found in the as-filed specification of the Subject Application. New claims 99-101 do not add new matter to the Subject Application. New claims 99-101 read on the invention of Group I, elected by Applicant in the Response to Restriction Requirement filed on July 6, 2006. New claims 99-101 are patentable for at least the reasons discussed below in connection with claims 1, 10, and 11.

IV. Claim Rejections under 35 U.S.C. § 112

A. Claims Rejections under 35 U.S.C. § 112, first paragraph

The Office asserts that claims 11, 13, 16, 18, 20-22, 25, and 26 lack written description support because the specification allegedly does not contain support for the ferritic stainless steel being uncoated as recited in claim 11. Applicant respectfully disagrees.

The written description requirement only requires that the specification convey with reasonable clarity to persons skilled in the art that the inventors were in possession of the invention as claimed. MPEP § 2163. "If a skilled artisan would have understood the inventor to be in possession of the claimed invention at the time of filing, even if every nuance of the claims is not explicitly described in the specification, then the adequate description requirement is met." *Id.* The claims in a patent application may be supported in the specification through express, implicit, and/or inherent disclosure. *Id.*

In the present case, a person skilled in the art would have understood the present inventor to have been in possession of a method for making a ferritic stainless steel article having an uncoated electropolished oxidation resistant surface. Example 1 in the specification provides:

> A coil of AL 453™ alloy was provided by the conventional process of casting the alloy to a slab or ingot, hot reducing to a band, cold rolling to finished gauge with intermediate stress relieving anneals, and a final anneal in hydrogen. Several 1" x 2" test coupons were prepared from the coil and processed by three different surface treatments. Each coupon had an initial thickness of 0.075" and a standard 2BA finish, and was degreased and had finished edges. This surface finish is generally referred to herein as a "mill" surface, and samples including that surface are referred to herein as "mill" samples. Several mill samples were further processed by grinding using 120 grit SiC paper to remove nominally 0.005" per side. Samples prepared in this way are referred to herein as "ground" samples. Several of the ground samples were electropolished in an electropolishing solution including, by volume, 25% sulfuric acid - 47% phosphoric acid - 28% glycolic acid for 20 minutes (samples flipped every 5 minutes) at 1 amp/inch^2 at approximately 170°F (about 77°C) to provide several "electropolished" samples. (Specification, para. [0052]).

A person skilled in the art would clearly recognize that the "electropolished" samples prepared in Example 1 were uncoated. The ferritic stainless steel was cast, hot reduced, cold rolled, annealed, ground, and electropolished. Clearly, the "electropolished" samples were never coated in Example 1.

Example 1 further describes that the three surface types were characterized using electron microscopy both before exposure to an oxidizing atmosphere and after exposure to an oxidizing atmosphere (specification, para. [0053]-[0058]). As described in the specification, "the rate of oxidation of the electropolished samples was several orders of magnitude lower than that of the mechanically finished mill and ground surfaces" (specification, para. [0056]). Thus, the specification clearly supports an "uncoated electropolished oxidation resistant surface", as recited in claim 11.

Whether or not the specification expressly recites the word "uncoated" is not controlling under the test for compliance with the written description requirement under 35 U.S.C. § 112, first paragraph. The test for compliance with the written description requirement is simply whether the specification conveys possession of the

claimed invention (*Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1560 [19 USPQ2d 1111, 1114] (Fed. Cir. 1991)); not whether the specification contains literal description in the same terms. MPEP § 2163.02 ("The subject matter of the claim need not be described literally (*i.e.*, using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement."). Indeed, "[w]hile there is no *in haec verba* requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure." MPEP § 2163.

In the present case, an article having an uncoated electropolished oxidation resistant surface was described, at least implicitly, in the specification in Example 1. The description in Example 1 fully satisfies the test for compliance with the written description requirement. Therefore, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

B. Claims Rejections under 35 U.S.C. § 112, second paragraph

The Office asserts that claim 25 is indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Office contends that it is unclear if "the article" recited in claim 25 is the "ferritic stainless steel" recited in claim 11 (claim 25 depends from claim 11). Claim 25 is amended herein to recite "ferritic stainless steel". Applicant respectfully submits that the amendment renders the rejection moot. Therefore, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

V. Claim Rejections under 35 U.S.C. § 103(a)

The Office asserts that claims 1-5, 9-11, 13, 16, 18, 20-22, 25, and 26 would have been obvious in view of various cited references. Applicant respectfully disagrees. The various combinations of the cited references applied by the Office to assertedly reject the claims of the Subject Application are addressed below under separate headings.

A. The Standards for Rejections under 35 U.S.C. § 103(a)

Obviousness under 35 U.S.C. § 103(a) is a question of law based on at least three underlying findings of fact:

(1) The scope and content of the prior art;

(2) The differences between the claimed invention and the prior art; and

(3) The level of ordinary skill in the pertinent art.

Based on these facts, the legal conclusion of whether a claim, as a whole, is obvious or non-obvious is made based on a preponderance of the evidence standard. *See Graham v. John Deere Co.*, 383 U.S. 1, 17-18 [148 USPQ 459] (1966); *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 [82 USPQ2d 1385] (2007); *In re Oetiker*, 977 F.2d 1443 [24 USPQ2d 1443] (Fed. Cir. 1992).

To this end, the MPEP (§ 706.02(j)) provides that the contents of a § 103(a) rejection set forth in an Office Action should include:

(1) the relevant teachings of the prior art relied upon, preferably with reference to the relevant column or page number(s) and line number(s) where appropriate;

(2) the difference or differences in the claim over the applied reference(s);

(3) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter; and

(4) an explanation as to why the claimed invention would have been obvious to one of ordinary skill in the art at the time the claimed invention was made.

As part of the determination of the scope and content of the prior art, prior art references must be considered in their entirety, *i.e.*, as a whole, including portions that would lead away from the claimed invention. MPEP § 2141.02(VI). As part of the determination of the differences between the claims and the prior art, all of the words and features recited in the claims must be considered in judging the patentability of the claim against the prior art. MPEP § 2143.03. Indeed, in determining the differences

between the prior art and the claims, the question under § 103(a) is whether the claimed invention as a whole would have been obvious. MPEP § 2141.02.I. It is the invention as a whole, and not some part of it, which is evaluated for obviousness under § 103(a). MPEP § 2141.02.V.

Accordingly, a determination regarding the obviousness or non-obviousness of the claims in a patent application involves a direct comparison of the subject matter of the claims, as a whole, to the teachings of the cited references, as a whole. A *prima facie* case of obviousness requires that the claims would have been obvious to a person skilled in the art at the time of the invention despite the differences between the claims and the teachings of the cited references. Thus, rejections on obviousness grounds cannot be sustained with mere conclusory statements or unsupported assertions. Office personnel must clearly communicate logical reasoning with rational underpinnings based on a preponderance of factual evidence to support the legal conclusion of obviousness. *See* MPEP § 2141.

Applicant respectfully submits that the Office has failed to properly establish a *prima facie* case under § 103(a). In the present matter, there are very significant differences and substantial distinctions between the subject matter of the present claims and the disclosures in the cited references. These differences and distinctions create a very large gap between the prior art and the claimed invention that is "so great as to render the [present claims] nonobvious to one reasonably skilled in the art." MPEP § 2141.III (quoting *Dann v. Johnston*, 425 U.S. 219, 230 [189 USPQ 257, 261] (1976)).

B. Rejections under § 103(a) based on Ishibashi

The Office asserts that claims 1-5, 9-11, 13, 16, 18, 20-22, and 26 would have been obvious in view of Ishibashi. Applicant respectfully disagrees.

Ishibashi describes a method for preparing a surface of an alloy component in a solar collector so that the surface advantageously absorbs solar radiation. The method described in Ishibashi includes processing an alloy substrate so

that it has a "mirror-like surface of [a] predetermined roughness", and then tightly adhering a coating or film of a predetermined metal oxide to the mirror-like surface. The metal oxide is selected so that, when applied as a film to the mirror-like surface, it has the effect of selectively absorbing solar radiation and preventing reflection of the solar radiation from the surface. (Ishibashi, c.2, ll.39-44).

The techniques described in Ishibashi used to form the metal oxide film on the prepared mirror-like surface of the substrate include: (1) subjecting the surface to a wet or dry chemical treatment, such as by applying to a particular acidic or alkaline oxidizing composition to the surface; (2) using vacuum evaporation coating techniques, such as "spattering" or arc discharge techniques; (3) adhering metal oxide powders to the surface using a polymeric or other binder that is relatively transparent to infrared radiation; and (4) simultaneously adhering and oxidizing a stainless steel coating on the mirror-like surface, such as by "chromalyzing" or cladding, wherein the stainless steel differs from the surface. (Ishibashi, c.4, ll.26-45 and c.8, ll.10-25). Ishibashi explains that the oxide film formed on the mirror-like surface has a thickness in the range of 500-2000 Angstroms (c.10, ll.29-38). Thus, the processed surface of the substrate in Ishibashi is not left exposed, but instead is actively coated with a relatively thick layer of a metal oxide material having certain spectral properties facilitating absorption of solar radiation by the surface.

The methods recited in claims 1, 10, and 11 do not include a step of actively forming a metal oxide coating on the electropolished surface. As used in claim 11, "uncoated" is intended to mean that a material is not actively applied to or deposited on the surface as a film or other coating; "uncoated" is not intended to exclude, for example, conversion layers such as oxide scale that forms from oxidation of the exposed electropolished surface. In contrast, Ishibashi requires actively applying a coating on the underlying substrate. Ishibashi does not teach or suggest electropolishing any exposed surfaces so that the exposed surfaces will develop an oxide scale as recited in the claims of the Subject Application.

As described in the Subject Application, the present inventor discovered that an electrically conductive, slow growing, aluminum-rich, oxidation resistant oxide

scale comprising aluminum, chromium, and iron, and having a particular hematite structure, will develop on an electropolished surface of a ferritic stainless steel when subjected to a high temperature oxidizing atmosphere, provided that the ferritic stainless steel contains certain critical levels of aluminum, rare earth metal(s), and chromium. (Specification, para. [0045] and [0052]-[0073]). The unique scale decreases the oxidation rate of the surface of the steel by several orders of magnitude relative to identical steel that has not been electropolished (*i.e.*, non-electropolished). There is nothing described in Ishibashi that would have taught or suggested these features.

The Office asserts that Ishibashi discloses processing substantially the same composition by the same process and therefore, assertedly, the recited composition, crystal structure, and lattice parameters of the scale would be expected, citing to MPEP § 2112.01.I. Applicant respectfully submits that this is incorrect. This section of the MPEP describes case law that stands for the proposition that objects having the same composition and the same structure exhibit the same properties. See MPEP § 2112.01.II, which provides:

> "Products of **identical** chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the **identical** chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990) (Applicant argued that the claimed composition was a pressure sensitive adhesive containing a tacky polymer while the product of the reference was hard and abrasion resistant. "The Board correctly found that the virtual **identity** of monomers and procedures sufficed to support a prima facie case of unpatentability of Spada's polymer latexes for lack of novelty."). (Emphases added).

In other words, only the same compositions have the same properties. A broad range of compositions disclosed in the prior art would not be expected to inherently possess the particular structure and properties exhibited by a specific composition, especially where the structure and properties are not even suggested in the prior art.

The Office is apparently attempting to remedy the deficiencies in Ishibashi by relying on an inherency argument. However, as set forth in MPEP § 2141.02.V, **an obviousness rejection cannot be based on a theory of inherency**. Rather, in order to rely on some allegedly inherent feature of the prior art when establishing an obviousness rejection, **the allegedly inherent feature must have been known or recognizable in the art** at the time that the claimed invention was made.

> Obviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a certain feature is later established. *In re Rijckaert*, 9 F.2d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993). (MPEP 2141.02.V).

Moreover, to establish inherency, the extrinsic evidence (*i.e.*, the cited references) must make clear that the missing descriptive matter is **necessarily present** in the thing described in the reference, and that it would be so **recognized by a person skilled in the art**. MPEP § 2112.IV (citations omitted). In this regard, the MPEP provides that:

> "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." MPEP § 2112.IV (citations omitted) (emphasis in original).

Accordingly, for the structure and properties recited in the claims of the Subject Application to have been expected, as asserted by the Office, the particular structure and properties must be necessarily present and recognizable in the art. In the present case, however, the structure and properties recited in the claims of the Subject Application are not taught or suggested by the cited references. Therefore, the Office's reliance on MPEP § 2112.01 is improper, and the unsupported assertion that the recited structure and properties would have been expected is a conclusory statement that cannot form the basis of a *prima facie* case under § 103(a).

In addition, Applicant respectfully submits that Ishibashi does not teach or suggest providing a ferritic stainless steel as recited in claims 1, 10, and 11. Claims 1,

10, and 11 each recite a ferritic stainless steel comprising 0.2 to 1.0 weight percent aluminum, 16 to less than 30 weight percent chromium, and 0.02 to 1.0 weight percent total rare earth metals. As described in the Subject Application, these ranges are required for the formation of the particular scale and oxidation resistance recited in the claims of the Subject Application (para. [0071-[0073]).

In contrast, Ishibashi discloses an extremely broad range of steel compositions that may include 0.001 - 5.00 weight percent aluminum and 0.001 - 5.00 weight percent yttrium. Thus, the chemistry of the stainless steel compositions disclosed in Ishibashi is extremely broad. Indeed, Ishibashi expressly acknowledges that the disclosed stainless steels may be either ferritic or austenitic (c.3, ll.50-54). The alloy chemistry recited in the claims of the Subject Application is significantly narrower as compared to the broad and unspecific chemistry disclosed in Ishibashi. Furthermore, there is no disclosure in Ishibashi that would lead a person skilled in the art to experiment or otherwise determine the critical ranges for aluminum, chromium, and rare earth elements as recited in claims 1, 10, and 11 of the Subject Application.

Moreover, MPEP § 2144.05.I states that if a cited reference's disclosed range is so broad as to encompass a very large number of possible distinct compositions, "this might present a situation analogous to the obviousness of a species when the prior art broadly discloses a genus." (*In re Peterson*, 315 F.3d 1325, 1330 [65 USPQ2d 1379, 1382-83] (Fed. Cir. 2003); *In re Harris*, 409 F.3d 1339 [74 USPQ2d 1951] (Fed. Cir. 2005) and MPEP § 2144.08).

Such a situation exists here because the ferritic stainless steel recited in the claims of the Subject Application is clearly distinct from and different than the very broad steel compositions disclosed in Ishibashi. Any overlap between the claims of the Subject Application and Ishibashi is fortuitous given the very broad ranges disclosed in Ishibashi. Although ranges in the prior art that are not especially broad may invite routine experimentation to discover optimum values where appropriate result effective variables are identified in the prior art (MPEP § 2144.05.II), here Applicant submits that:

(1) the ranges disclosed in Ishibashi are so broad that it would require nonobvious invention to arrive at the ranges recited in the claims of the Subject Application (*In re Peterson*, 315 F.3d 1325, n.1 [65 USPQ2d 1379, n.1]); and

(2) Ishibashi fails to identify any result effective variable that could be optimized to arrive at the ranges recited in the claims of the Subject Application (MPEP § 2144.05.II).

Applicant also respectfully submits that Ishibashi does not teach or suggest processing in the same manner as recited in claims 1, 10, and 11. Ishibashi discloses the following:

> homogeneous, uniform oxide film is not formed.
>
> One of the effects of the present invention is to improve the selective absorption property of the selective absorption surface of the solar collector by finishing the surface of the stainless steel substrate with the roughness of Ra less than 0.07 or Rz less than 0.2 by the mechanical polishing, the chemical abrasion and the electrolytic polishing, removing the many disadvantages coming from unhomogeneous of the metal plate surface. One of the examples showing the efficiency of the selective absorption surface of the solar collector having the appropriate roughness was shown in FIG. 4. In the example, the stainless steel (304 (AISI) 683/XIII 11 (ISO)) was treated by a liquid homing method using glass powders of a particle size of 20 – 100 μm to form a clean surface having the surface roughness of Ra 0,2 μm or Rz 1.0 μm and then oxidized said surface according to the acidic oxidation method of the item (3*a*).

(c.7, ll. 34-50). The only reference to electropolishing in Ishibashi is in connection with the conventional reduction of surface roughness of a stainless steel substrate. However, as discussed above, Ishibashi requires coating the substrate with an oxide coating. Accordingly, Ishibashi does not teach or suggest electropolishing an exposed surface, let alone electropolishing to chemically modify an exposed surface so that the surface will develop an oxidation resistant scale as recited in the claims of the Subject Application.

Applicant notes that claim 13, for example, recites that the "exposed electropolished surface develops an aluminum-rich oxide scale comprising iron and

chromium and having a hematite structure, a_o in the range of 4.95 to 5.04 Å, and c_o in the range of 13.58 to 13.75 Å, when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." In Ishibashi, of course, the substrate surface is coated with a relatively thick coating of a predetermined material. Given that fact, it is submitted that the underlying substrate surface could not possibly develop an oxide scale having the features recited in claim 13, for example. As a result, Ishibashi can not teach or suggest – inherently or otherwise – the scale having the structure recited in the claims of the Subject Application because the exposed surfaces of the Ishibashi solar reflector are coated with a predetermined material. This would physically and chemically prevent the formation of a scale having the features recited in the claims of the Subject Application.

For at least the foregoing reasons, the methods recited in claims 1, 10, and 11 would not have been obvious in view of Ishibashi. Therefore, Applicant respectfully requests withdrawal of the rejections under § 103(a) based on Ishibashi.

C. Rejections under § 103(a) based on Suda in view of Ono

The Office asserts that claims 1-5, 9-11, 13, 16, 18, 20-22, 25, and 26 would have been obvious in view of Suda and Ono. Applicant respectfully disagrees.

Suda describes a method for treating the surface of a stainless steel. The method involves immersing a stainless steel material in an aqueous alkaline solution containing iron oxide ions (FeO_4^{2-}) (para. [0013]). The iron oxide ions (FeO_4^{2-}) in the solution chemically react with the stainless steel surface to form a stable gamma- iron oxide (γ-Fe_2O_3; maghemite) surface layer (para. [0014]). Accordingly, Suda teaches the electrochemical formation of a gamma- iron oxide layer on the surface of stainless steel from aqueous iron oxide ions:

$$FeO_4^{2-}{}_{(aq)} \rightarrow Fe_2O_{3\,(s)}$$

However, Suda does not teach or suggest electropolishing, let alone electropolishing to chemically modify an exposed surface so that the surface will develop an oxidation

resistant scale as recited in the claims of the Subject Application.

Electropolishing is an electrochemical process wherein a portion of a metal or metal alloy is electrolytically removed in a highly ionic solution by the action of an electric potential and current. As mentioned above, the present inventor discovered that electropolishing certain ferritic stainless steels will chemically modify the electropolished surface of the steel so that the surface will develop a particular oxidation resistant scale under certain conditions.

In contrast, Suda teaches the purposeful formation of an iron oxide layer on the surface of an underlying stainless steel substrate. Like Ishibashi, discussed above, Suda cannot teach or suggest – inherently or otherwise – an oxide scale having the structure recited in the claims of the Subject Application because the exposed surfaces of the steel described in Suda are coated with a gamma- iron oxide layer. This would physically and chemically prevent the formation of a scale having the features recited in the claims of the Subject Application.

Gamma iron oxide, also known in the art as maghemite, exhibits a crystal structure intermediate to both magnetite (Fe_3O_4) and hematite (α-Fe_2O_3). Therefore, the gamma- iron oxide coating described in Suda is chemically and structurally different than and distinct from an oxide scale having the features recited in the claims of the Subject Application.

The Office cites Ono for the disclosure of a ferritic stainless steel having 0-1 weight percent aluminum and 0-0.2 weight percent rare earth metals. However, Ono does not remedy the deficiencies of Suda as discussed above.

Furthermore, the inherency arguments asserted by the Office in connection with the combined disclosures of Suda and Ono – which are essentially identical to the inherency arguments asserted in connection with Ishibashi, discussed above – also fail to remedy the deficiencies of the cited references. Applicant hereby incorporates the remarks set forth above in *section V.B* regarding the legal and factual insufficiency of the Office's inherency arguments, which are equally applicable to the § 103(a) rejections based on Suda and Ono. There is no disclosure in Suda or Ono that

would lead a person skilled in the art to the methods recited in claims 1, 10, and 11 of the Subject Application.

For at least the foregoing reasons, the methods recited in claims 1, 10, and 11 would not have been obvious in view of Suda and Ono. Therefore, Applicant respectfully requests withdrawal of the rejection under § 103(a) based on Suda and Ono.

D. Rejections under § 103(a) based on Szummer in view of Ono

The Office asserts that claims 1-5, 9-11, 13, 16, 18, 20-22, and 26 would have been obvious in view of Szummer and Ono. Applicant respectfully disagrees.

Szummer describes using electropolishing to prepare ferritic stainless steel specimens for studying the "surface microstructure of ferritic chromium stainless steels subjected to hydrogen charging" (abstract). Szummer states that:

> After cutting, the specimens were first mechanically polished and then electropolished .... TEM specimens were prepared by preliminary electrolytic thinning without perforation, then cathodically charged and thinned from one side by electrochemical polishing until perforation. The H-charged surface was left unaffected by the preparation procedure so that the H-induced microstructural changes in the sample could be examined ... using optical, scanning and transmission electron microscopes .... (Page 356, column 2).

Szummer does not teach or suggest electropolishing as a step in a "method for making a ferritic stainless steel article having an oxidation resistant surface", as recited in claims 1, 10 and 11 of the Subject Application. In fact, Szummer lacks any teaching, suggestion, or motivation whatsoever to use electropolishing on a ferritic stainless steel alloy comprising 0.2 to 1.0 weight percent aluminum, 16 to less than 30 weight percent chromium, and 0.02 to 1.0 weight percent total rare earth metal, to produce an oxidation resistant surface as recited in claims 1, 10, and 11 of the Subject Application. As a result, the Office has failed to establish a *prima facie* case under §103(a).

As discussed in the Response filed on March 10, 2009, the metallographic art of electropolishing stainless steels for metallographic microscopic examination is a conventional sample preparation technique. Szummer merely discloses the use of electropolishing in this manner, and there is absolutely no reason why a person skilled in the art would look to Szummer to develop a "method for making a ferritic stainless steel article having an oxidation resistant surface". Szummer merely mentions electropolishing ferritic stainless steels for metallographic analysis; there is no teaching or suggestion that electropolishing would be an effective means to prepare an oxidation resistant surface on ferritic stainless steel, let alone teaching or suggesting the particular oxide crystal structure and the critical aluminum, chromium, and rare earth metal content.

The Office cites Ono for the disclosure of a ferritic stainless steel having 0-1 weight percent aluminum and 0-0.2 weight percent rare earth metals. However, Ono does not remedy the deficiencies of Szummer as discussed above.

Furthermore, the inherency arguments asserted by the Office in connection with the combined disclosures of Szummer and Ono – which are essentially identical to the inherency arguments asserted in connection with Ishibashi, discussed above – also fail to remedy the deficiencies of the cited references. Applicant hereby incorporates the remarks set forth above in *section V.B* regarding the legal and factual insufficiency of the Office's inherency arguments, which are equally applicable to the § 103(a) rejections based on Szummer and Ono. There is no disclosure in Szummer or Ono that would lead a person skilled in the art to the methods recited in claims 1, 10, and 11 of the Subject Application.

Szummer merely discloses that electropolishing can be used for metallographic sample preparation of ferritic stainless steels for microscopic analysis. Simply because other stainless steels may comprise compositions that fall with the ranges recited in claims 1, 10, and 11 would not have rendered the **methods** recited in claims 1, 10, and 11 obvious. Examination of the Subject Application, *e.g.*, paragraphs [0069]-[0074] and Figures 11-13, demonstrates that the methods recited in claims 1, 10, and 11 require the recited chemistry. There is absolutely no teaching, suggestion, or

motivation in Szummer or Ono to use electropolishing to improve high temperature oxidation resistance of ferritic steels having the composition and resulting scale as recited in the claims of the Subject Application.

In the present case, the Office has provided no explicit rationale as to why one skilled in the art, when considering Szummer in view of Ono, would have reason to electropolish a ferritic stainless steel other than for metallographic sample preparation. Certainly, the cited references do not teach or suggest a method for making a ferritic stainless steel article having an oxidation resistant surface comprising the features recited in the claims of the Subject Application. Indeed, the Office admits that none of the cited references teach or suggest the oxide scale having the composition and hematite structure that the present inventor discovered is formed when an electropolished surface comprising the composition recited in the claims is exposed to certain oxidizing conditions.

The Office alleges, however, that the cited references teach the same or substantially the same composition and the same process, and therefore, the recited hematite structure and hematite lattice parameters would be expected. Throughout the Office Action, the Office cites to MPEP § 2112.01.I for support of the asserted inherency. However, as discussed above, **an obviousness rejection cannot be based on a theory of inherency**. Rather, in order to rely on some allegedly inherent feature of the prior art when establishing an obviousness rejection, **the allegedly inherent feature must have been known or recognizable in the art** at the time that the claimed invention was made. MPEP 2141.02.V; *In re Rijckaert*, 9 F.2d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993).

The Office provides no evidence that the composition and hematite structure of the recited oxide scale, let alone the particular lattice parameters, were known or recognizable when the claimed invention was made. The Office admits that these features are not taught or suggested in the cited references. Therefore, the obviousness rejections based on inherency are improper.

For at least the foregoing reasons, the methods recited in claims 1, 10, and 11 would not have been obvious in view of Szummer and Ono. Therefore, Applicant respectfully requests withdrawal of the rejection under § 103(a) based on Szummer and Ono.

E. Rejections under § 103(a) based on Szummer separately in view of Linden, Uematsu, or Matsui

The Office asserts that various claims of the Subject Application, including claims 1, 10, and 11, would have been obvious in view of Szummer separately in combination with Linden, Uematsu, or Matsui. Applicant respectfully disagrees.

The Office cites to Ono, Linden, Uematsu, and Matsui, in the alternative, for the disclosure of a ferritic stainless steel including aluminum and rare earth metals. However, these secondary references do not remedy the deficiencies of Szummer as discussed above.

For at least the foregoing reasons, the methods recited in claims 1, 10, and 11 would not have been obvious in view of Szummer in combination with any of the secondary references cited by the Office. Therefore, Applicant respectfully requests withdrawal of all rejections under § 103(a) based on Szummer.

F. Declaration of Brady under 37 C.F.R. § 1.132

Assuming only for the sake of argument that the Office has established a *prima facie* case of obviousness, Applicant maintains its earlier-presented position that any such case is clearly rebutted by secondary considerations because the corrosion resistance improvements obtained by the claimed method were wholly unexpected and were significant. Applicant refers to the Declaration of Dr. Michael P. Brady ("the Brady Declaration"), a senior researcher at Oak Ridge National Laboratory, Oak Ridge, Tennessee, which is of record in the Subject Application. As discussed in the Declaration, Dr. Brady has substantial experience in the area of oxidation of stainless

steels and other alloys, has evaluated and developed ferritic stainless steels and related alloys for use in solid oxide fuel cells, and is experienced with electropolishing and other surface preparation techniques.

In the Brady Declaration, Dr. Brady testifies that prior to the filing date of the Subject Application metallurgists did not believe that the high temperature oxidation resistance of ferritic stainless steels would be improved by electropolishing. Nevertheless, the Office asserts that the Brady Declaration is unpersuasive because it fails to set forth evidence to substantiate the allegedly conclusory statements it sets forth. This basis for discounting the declaratory evidence is improper and cannot be maintained.

In paragraph 9 of the Brady Declaration, Dr. Brady declares:

> At a time just prior to September 3, 2003, metallurgists conventionally believed that the high temperature oxidation resistance of a ferritic stainless steel surface would not be improved by electropolishing (flattening) the surface. Instead, metallurgists conventionally believed that mechanically deforming (roughening) the surface of a stainless steel would generally improve oxidation resistance by allowing a greater concentration of chromium in the steel access to the surface, to form a protective scale on the surface. It was believed that because electropolishing flattened the steel's surface and thereby reduced surface roughness, access of chromium to the surface would be inhibited, and this would inhibit growth of the chromium-rich scale necessary to prevent oxidation. Confirmation of the conventional beliefs regarding surface roughness and oxidation resistance in alloys generally is provided in the following references: C. S. Giggins et al., "The Effect of Alloy Grain-Size and Surface Deformation on the Selective Oxidation of Chromium in Ni-Cr Alloys at Temperatures of 900°C and 1000°C", 245 Transactions of the Metallurgical Society of AIME at 2509-2514 (December 1969); and J. M. Rakowski et al., "The Effect of Surface Preparation on the Oxidation Behavior of Gamma TiAl-Base Intermetallic Alloys", 35 Scripta Materialia at 1417-1422 (1996). Both of these references suggest the advantage of a mechanically deformed surface in regards to oxidation resistance.

Accordingly, in addition to providing his own expert opinion on the subject, Dr. Brady references scientific journals in his declaration confirming that persons having ordinary skill in the metallurgical arts believed that roughening the surface of a stainless steel, and not flattening the surface, would improve oxidation resistance. Applicant also discussed this conventional belief in detail in the Response filed on August 23, 2007. Applicant respectfully refers the Office to that response for its discussion of what a person of ordinary skill in the art would have expected regarding surface roughness of stainless steels and oxidation resistance.

The present record lacks any evidence whatsoever that would support a prior recognition or suggestion in the art that the oxidation resistance of ferritic stainless steels having the composition recited in the claims of the Subject Application or, for that matter, any other ferritic stainless steel, would be improved by electropolishing. Thus, with reference to the evidence in the references cited in the Brady Declaration, Dr. Brady has found the oxidation resistance results reported in the Subject Application for electropolished ferritic stainless steel to be unexpected and surprising, as would any ordinarily skilled person in the metallurgical arts.

Applicant maintains that compelling evidence of unexpected results is included in the Subject Application and was confirmed by the Brady Declaration. Applicant further maintains that the statements presented by Dr. Brady in the Brady Declaration are not conclusory, but rather is uncontroverted expert testimony. The Examiner has identified no basis for discounting or rebutting Dr. Brady's statements, and Dr. Brady has submitted additional documentary evidence with his declaration supporting his statements. Moreover, contrary to the Office's assertions, the subject matter recited in the claims of the Subject Application and the evidence of unexpected results provided in the Subject Application are commensurate in scope. The unexpected results and nonobviousness of the claims are both bolstered by Dr. Brady's expert testimony.

Therefore, assuming only for the sake of argument that the Office has established a *prima facie* case of obviousness, the proffered evidence of surprising and unexpected results rebuts any legal conclusion of obviousness based on a

preponderance of the evidence. Therefore, the § 103(a) rejections should all be withdrawn.

G. Criticality of claimed ranges and unexpected results

In the Office Action, the Office states that the specification of the Subject Application contains numerous plots and it is assertedly unclear what evidence is being referred to as unexpected results. Applicant respectfully submits, however, that the specification clearly sets forth the work performed by the present inventor that unquestionably demonstrates the unexpected results. In addition, the compositional ranges recited in the claims of the Subject Application are shown in the specification to correlate with the unexpected results. Applicant submits that this categorically proves that the unexpected results shown in the specification are commensurate in scope with the claims of the Subject Application.

Applicant shows in paragraphs [0052]-[0058] of the specification that the rate of oxidation of electropolished samples of a ferritic stainless steel having a composition that falls within the recited compositional ranges was several orders of magnitude lower than that of otherwise identical non-electropolished samples. This significant reduction was unexpected because there is no disclosure in the prior art that teaches or suggests such an improvement due to electropolishing.

Applicant shows in paragraphs [0059]-[0064] of the specification that the reduction in oxidation rate appears to be unique to an electropolished surface of a ferritic stainless steel having a composition that falls within the recited compositional ranges. Mechanical polishing does not produce such unexpectedly improved oxidation resistance, and mechanical polishing after electropolishing will reverse the unexpected improvement in oxidation resistance due to the electropolishing.

Applicant shows in paragraphs [0065]-[0068] of the specification that the unexpected improvement in oxidation resistance due to the electropolishing results from the development of a particular surface oxide scale, which is characterized as comprising aluminum, chromium, and iron, and having a hematite structure that is

different from the structure of Fe_2O_3 (*i.e.*, alpha iron oxide), alpha Cr_2O_3, and alpha Al_2O_3. Indeed, Applicant measured the lattice parameters of the unexpected oxide scale, and showed how the crystal structure differs from Fe_2O_3 (*i.e.*, alpha iron oxide), alpha Cr_2O_3, and alpha Al_2O_3.

Applicant shows in paragraphs [0069]-[0074] of the specification that certain ferritic stainless steel chemistries are critical to the formation of the unexpected scale and the unexpected improvement in oxidation resistance. Indeed, Applicant shows that 0.2 to 1.0 weight percent aluminum, 16 to 30 weight percent chromium, and 0.02 to 1.0 weight percent total rare earth metal(s) are necessary to achieve the unexpected improvement in oxidation resistance without sacrificing electrical conductivity or resulting in over-oxidation.

The features shown in the specification as correlating to the unexpected improvement in oxidation resistance are all recited in the claims of the Subject Application. These features and the unexpected results are confirmed by the uncontroverted expert testimony of Dr. Brady, discussed above. Thus, based on a preponderance of the evidence, the claims of the Subject Application would not have been obvious, are clearly patentable, and should be allowed.

VI. Request for Rejoinder

According to MPEP § 821.04, to be eligible for rejoinder, a non-elected claim must depend from or otherwise require all the limitations of an allowable claim. 37 C.F.R. § 1.141(a). Indeed, the MPEP states that "[o]nce a generic claim is allowable, all of the claims drawn to species in addition to the elected species which require all the limitations of the generic claim will ordinarily be allowable over the prior art in view of the allowability of the generic claim, since the additional species will depend thereon or otherwise require all of the limitations thereof." Here, withdrawn claims 6, 14, 23, 24, 27, and 28 each depend, directly or indirectly, from independent claim 1 or 11. Therefore, claims 6, 14, 23, 24, 27, and 28 should be rejoined in view of the allowability of claims 1 and 11, discussed above.

VII. Reservation of Arguments

The novelty and non-obviousness of certain claims is discussed in detail above. Applicant does not otherwise concede, however, the correctness of the rejections with respect to any of the claims not particularly discussed in this Response. Accordingly, Applicant hereby reserves the right to make additional arguments as may be necessary to further distinguish the claims from the cited references based on additional features contained in the claims that were not discussed in this Response. A discussion of these differences is believed to be unnecessary at this time in view of the significant differences and clear distinctions between the claims and the cited references discussed in this Response.

VIII. Conclusion

Accordingly, for at least the reasons set forth herein, the pending claims are believed to be in condition for allowance. Applicant respectfully requests favorable reconsideration and allowance of the Application.

This Response should not be taken as acquiescence to any of the specific rejections, assertions, statements, etc., presented in the Office Action that Applicant has not explicitly addressed herein. Applicant reserves the right to specifically address all such rejections, assertions, and statements in continuing applications, subsequent responses, and/or appeal or pre-appeal proceedings.

If the undersigned can be of assistance to the Examiner in addressing any additional issues to advance the application to a condition of allowance, please contact the undersigned at the number set forth below.

Respectfully submitted,

28-Aug-09
Date

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